

$500 E_1 >$

1. A method for improving metal deposition on a patterned dielectric layer, comprising:

- a) cleaning the patterned dielectric layer in a processing chamber with a first plasma comprising predominantly argon;
- b) cleaning the patterned dielectric layer in the processing chamber with a second plasma consisting essentially of hydrogen and helium; and then
- c) depositing a metal on the patterned dielectric layer after exposing the dielectric layer to the first plasma and the second plasma.

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3. The method of claim 1, wherein the first plasma consists essentially of argon.

4. The method of claim 1, wherein the second plasma consists essentially of about 5% hydrogen by number of atoms and about 95% helium by number of atoms.

 $500 E_3 >$

6. A method for improving metal deposition on a patterned dielectric layer on a substrate, comprising:

- a) cleaning the patterned dielectric layer in a processing chamber with a first plasma comprising predominantly argon, wherein the first plasma is generated by supplying a RF power to a coil surrounding the processing chamber and supplying a RF power to bias a substrate support member supporting the substrate;
- b) cleaning the patterned dielectric layer in the processing chamber with a second plasma consisting essentially of hydrogen and helium, wherein the second plasma is generated by supplying the RF power to the coil surrounding the processing chamber and supplying the RF power to bias the substrate support member supporting the substrate; and
- c) depositing a metal layer after exposing the dielectric layer to the first plasma and the second plasma.

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8. The method of claim 6, wherein the first plasma consists essentially of argon.

9. The method of claim 6, wherein the second plasma consists essentially of about 5% hydrogen by number of atoms and about 95% helium by number of atoms.
10. The method of claim 6, further comprising depositing a barrier layer prior to depositing the metal layer.
11. The method of claim 6, wherein the RF power supplied to bias the substrate support member and generate the second plasma is less than the RF power supplied to bias the substrate support member and generate the first plasma.
12. The method of claim 6, wherein the first plasma is generated with about 300 W of the RF power supplied to the coil and about 300 W of the RF power supplied to bias the substrate support member, and the second plasma is generated with about 450 W of the RF power supplied to the coil and about 10 W of the RF power supplied to bias the substrate support member.
13. The method of claim 6, wherein each of the first plasma and the second plasma are maintained in the processing chamber for about 60 seconds.
14. A method for improving metal deposition on a patterned dielectric layer on a substrate, comprising:
- a) cleaning the patterned dielectric layer in a processing chamber with a first plasma consisting essentially of argon, wherein the first plasma is generated by supplying a RF power to a coil surrounding the processing chamber and supplying a RF power to bias a substrate support member supporting the substrate;
 - b) cleaning the patterned dielectric layer in the processing chamber with a second plasma consisting essentially of hydrogen and helium, wherein the second plasma is generated by increasing the supply of the RF power to the coil surrounding the processing chamber and reducing the supply of the RF power to bias the substrate support member supporting the substrate;

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- c) depositing a barrier layer on the patterned dielectric layer after exposing the dielectric layer to the first plasma and the second plasma; and
 - d) depositing a metal on the barrier layer.
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$sub E_5 >$ 17. The method of claim 14, wherein the second plasma consists essentially of about 5% of hydrogen by number of atoms and about 95% of helium by number of atoms.

18. The method of claim 14, wherein the first plasma is generated with about 300 W of the RF power supplied to the coil and about 300 W of the RF power supplied to bias the substrate support member, and the second plasma is generated with about 450 W of the RF power supplied to the coil and about 10 W of the RF power supplied to bias the substrate support member.

19. The method of claim 14, wherein each of the first plasma and the second plasma are maintained in the processing chamber for about 60 seconds.

20. The method of claim 14, wherein the first plasma is generated at about 0.8 mtorr, and the second plasma is generated at about 80 mtorr.

21. The method of claim 1, wherein the patterned dielectric layer comprises one or more features having an aspect ratio greater than 1:1.

22. The method of claim 6, wherein the patterned dielectric layer comprises one or more features having an aspect ratio greater than 1:1.

23. The method of claim 14, wherein the patterned dielectric layer comprises one or more features having an aspect ratio greater than 1:1.

24. A method for improving metal deposition on a patterned dielectric layer, comprising:

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- a) cleaning the patterned dielectric layer in a processing chamber with an argon plasma;
- b) cleaning the patterned dielectric layer in the processing chamber with a hydrogen plasma; and then
- c) depositing a metal on the patterned dielectric layer.

25. The method of claim 24, wherein the argon plasma consists essentially of argon.

26. The method of claim 24, wherein the argon plasma comprises argon and helium.

27. The method of claim 24, wherein the hydrogen plasma comprises hydrogen and helium.

28. The method of claim 24, wherein the hydrogen plasma comprises about 5% hydrogen by number of atoms and about 95% helium by number of atoms.

29. The method of claim 24, wherein the hydrogen plasma comprises about 5% hydrogen or more by number of atoms.

30. The method of claim 24, wherein the hydrogen plasma comprises about 95% helium or less by number of atoms.

31. The method of claim 24, wherein the argon plasma physically bombards an outer surface of the patterned dielectric layer.

32. The method of claim 31, wherein the hydrogen plasma chemically reacts with the outer surface of the patterned dielectric layer to reduce oxides formed on the outer surface.

33. A method for improving metal deposition on a patterned dielectric layer, comprising:

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- a) patterning a dielectric layer in a processing chamber to form one or more features having an aspect ratio greater than 1:1;
- b) cleaning the patterned dielectric layer in the processing chamber with a first plasma comprising predominantly argon;
- c) cleaning the patterned dielectric layer in the processing chamber with a second plasma comprising about 5% hydrogen by number of atoms and 95% helium by number of atoms; and then
- d) depositing a metal on the patterned dielectric layer after exposing the dielectric layer to the first plasma and the second plasma.